

Claims

What is claimed is:

1. A high pressure seal between a first mating part and a second mating part, the seal comprising:
  - a tube having an outer surface and an inner surface defining a hollow bore running through said tube along a first axis;
  - said bore beginning at a first end of said tube and ending at a second end;
  - said first end of said tube being adapted to fit into a first bore of said first mating part and said second end of said tube being adapted to fit into a second bore of said second mating part, said hollow bore allowing fluid communication between said first bore of said first mating part and said second bore of said second mating part; and
  - said tube being expandable radially about said first axis by a pressurized fluid within said hollow bore and causing said tube to form a seal between said first and second mating parts.
2. The high pressure seal of claim 1 wherein said tube expands longitudinally.
3. The high pressure seal of claim 1 wherein said tube is press fit into said first bore.
4. The high pressure seal of claim 1 wherein said tube is clearance fit into said second bore.
5. The high pressure seal of claim 1 having a thickness defined by a distance between said outer surface and said inner surface of approximately 1 millimeter.
6. The high pressure seal of claim 1 having a thickness defined by a distance between said outer surface and said inner surface of less than 1 millimeter.

7. The high pressure seal of claim 1 wherein said seal is exposed to pressures in excess of 20,000 PSI.

8. The high pressure seal of claim 1 wherein said seal has a smooth surface finish.

9. The high pressure seal of claim 1 wherein said seal is completely encompassed by said first and second mating parts.

10. A fuel injector comprising:  
a lower outer body,  
a tip at least partially disposed within said lower body and having an inner surface and an outer surface;  
an at least one orifice disposed within said tip and allowing communication between said inner surface and said outer surface;  
a fuel passage disposed within said tip and capable of communication with said at least one orifice;  
a needle valve at least partially disposed in said tip; said needle valve being moveable between a first position at which communication between said orifice and said fuel passage is closed and a second position at which communication between said orifice and said fuel passage is open;  
an upper body connected to said lower body, said upper body having a bore;  
a plunger at least partially disposed within said bore;  
a fuel pressurization chamber at least partially defined by said bore and said plunger;  
a cartridge valve assembly connected to said upper body;  
a first fluid bore within said upper body;  
a second fluid bore within said cartridge valve assembly;  
a high pressure seal connecting said first fluid bore and said second fluid bore; said high pressure seal being a tube having an outer surface and a hollow bore running through said tube along a first axis and defining an

inner surface; said bore beginning at a first end of said tube and ending at a second end; said first end of said tube being adapted to fit into said first fluid bore and said second end of said tube being adapted to fit into said second fluid bore and allowing fluid communication between said first fluid bore and said second fluid bore; said tube being expandable radially about said first axis by a pressurized fluid within said hollow bore and causing said tube to form a seal between said first and second fluid bores.

11. The high pressure seal of claim 10 wherein said tube expands longitudinally.

12. The high pressure seal of claim 10 wherein said tube is press fit into said first bore.

13. The high pressure seal of claim 10 wherein said tube is clearance fit into said second bore.

14. The high pressure seal of claim 10 having a thickness defined by a distance between said outer surface and said inner surface of approximately 1 millimeter.

15. The high pressure seal of claim 10 having a thickness defined by a distance between said outer surface and said inner surface of less than 1 millimeter.

16. The high pressure seal of claim 10 wherein said seal is exposed to pressures in excess of 20,000 PSI.

17. The high pressure seal of claim 10 wherein said seal has a smooth surface finish.

18. The high pressure seal of claim 10 wherein said seal is completely encompassed by said first and second mating parts.

19. A method of sealing a first mating part and a second mating part with a seal comprising a tube having an outer surface and an inner surface defining a hollow bore running through said tube along a first axis, said bore beginning at a first end of said tube and ending at a second end, the method comprising the steps of:

inserting said first end of said seal into a first bore of said first mating part;

inserting said second end of said seal into a second bore of said second mating part;

introducing pressurized fluid into said seal;

expanding said seal radially about said first axis with said pressurized fluid to form a seal between said first mating part and said second mating part.

20. The method of claim 19 further comprising the step of expanding said seal longitudinally.

21. The method of claim 19 wherein the step of inserting said first end further comprises the step of press fitting said first end of said seal into said first bore.

22. The method of claim 19 wherein the step of inserting said second end further comprises the step of clearance fitting said second end of said seal into said second bore.

23. The method of claim 19 further comprising the step of completely encompassing said seal in said first and second bores.